The International Tree Slime Project

DNA barcoding of fungal volcanoes

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Slime nodes (an international consortium studying a microbial consortium):

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Fig. 1. *Homo sapiens* examining slime flux on *Cornus* sp., Japan.

Fig. 2. *Canis lupus* examining slime flux on *Ostrya virginiana*, Canada

Introduction

Spring sap flux, visible as copious pink, orange or yellow slime oozing from cut or wounded surfaces of deciduous trees are a conspicuous feature of temperate forests. The exudates are prolifically colonized by fungi including yeasts, zygomycetes and hyphomycetes, which metabolize monosaccharides (as much as 1% w/v) moving from the roots to the leaves of the trees. The microbiology of these slime fluxes has been fairly well-studied in Europe (Weber 2006), but little studied elsewhere.

The dramatic appearance of these slime fluxes makes them the subject of fascination for the Citizen Scientist (www.youtube.com/watch?v=IPEIMjgJ4iQ). Beyond that, their sometimes dramatic occurrence on tree fruit crops, such as wine grapes, leads to questions from growers that can be difficult to answer with convincing scientific data.

With that in mind, the authors of this poster are initiating a broad, barcoding-enabled inventory of the fungal species growing in this niche on an international scale. We invite **all participants in this conference** to participate by watching for slime fluxes in their own countries next spring, and submitting samples to one of the Slime Nodes identified above. Or, exercise your own biological imperative, and examine the fluxes for the organisms that tickle your own fancy; nematodes, mites, flies (which are said to eat the yeasts!), bacteria. This bizarre biological phenomenon could present a fun opportunity for intertaxonomic collaboration!

Phylogenetic diversity

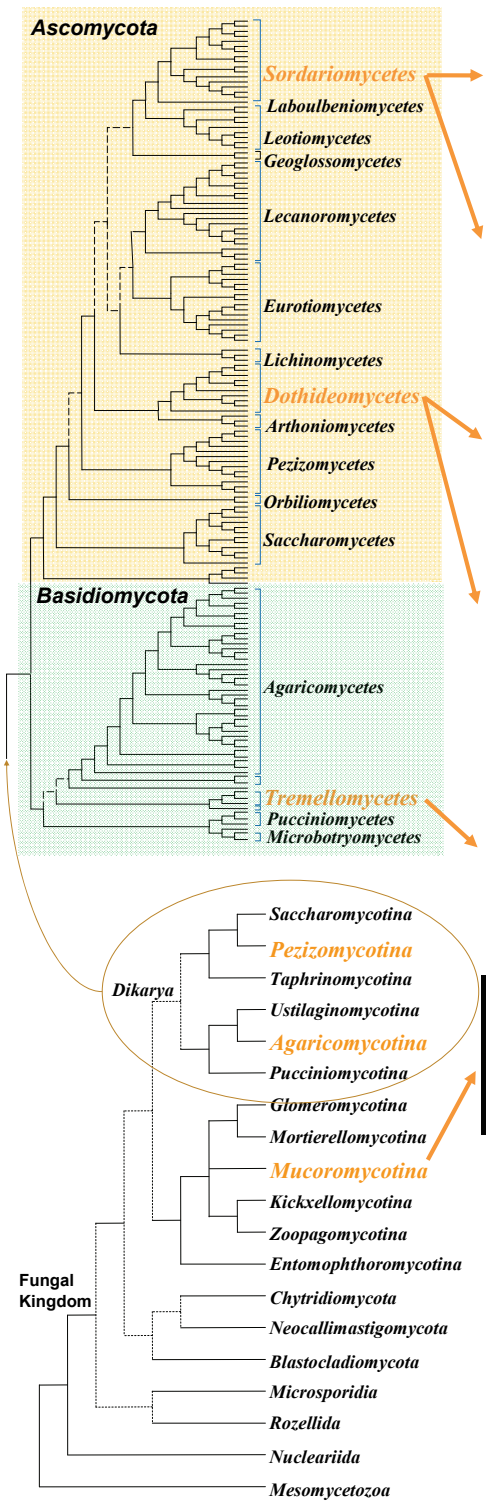
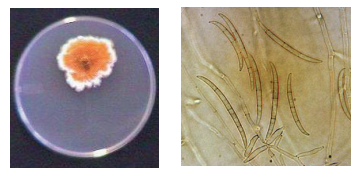
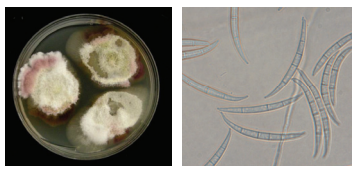


Fig. 3: Phylogenetic placement of some Tree Slime fungi in the Fungal Kingdom.

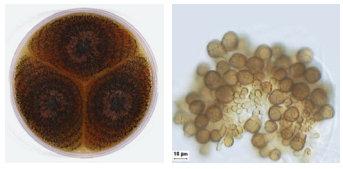
The culprits so far



- *Fusicolla merismoides* (family *Nectriaceae*) is often considered the definitive tree slime fungus. This appears to be a large complex of many phylogenetic species. Almost every strain barcoded to date has a different sequence.

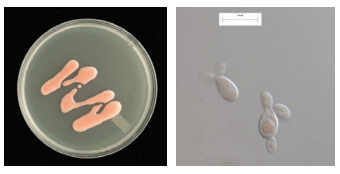


- *Fusarium acuminatum* (family *Nectriaceae*) was isolated from the wine grape fluxes shown in Figs 6, 7. Although closely related to the plant pathogens in this important mycotoxin producing genus, the species is not considered pathogenic, and so far is not considered a species complex.

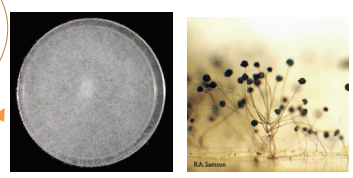


- *Epicoccum nigrum* (order *Pleosporales*) is common world-wide on dead plant material, and is now believed to be an endophyte. ITS barcodes suggest that this is a complex of 6 or 7 morphologically cryptic species.

- *Aureobasidium pullulans* (family *Dothioraceae*), the quintessential 'black yeast', enjoys growing in damp places like dish draining racks and window sills. We expect many other black yeasts will be recovered from tree slime.



- *Cryptococcus macerans* is one of the basidiomycetous yeasts that are so common in slime fluxes, and give the goo most of its orange colour. Despite the benign, limpid appearance, these 'Killer Yeasts' exude toxins that kill other species of yeast.



- *Rhizopus* sp. and other Zygomycetes do their best work in really moist environments, and we sometimes isolate them from slime fluxes. These fast growing fungi could cause problems for us if they overgrow inadequately dried swab samples (see below).

How to Sample

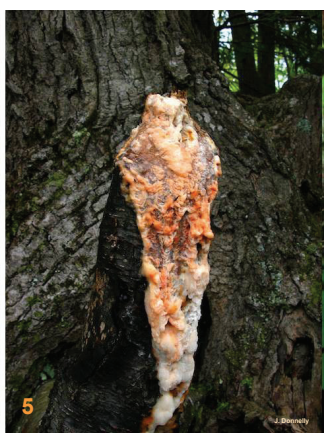
Important Note: Before sending samples to a Slime Node, please email the nearest coordinator and ask for complete instructions. Do not send samples across international borders without obtaining the required permits.

Sampling method. Photograph the tree and if possible identify the species; record when and where you found your treasure. Use a clean (preferably sterile) cotton swab, e.g. a Q-tip, and dip it in the slime. To reduce bacterial growth, keep the swab cold in a refrigerator until delivery. If this is not possible, try a) gently air drying the swab, without heat, until the slime is crusty and not sticky, wrap it in clean paper, then put it in a small plastic bag to stop leaking, but do not seal the bag, or b) if you work in a lab, stir the swab in 1 mL sterile water in a 2 mL plastic screw cap vial, and seal it well. Send the samples by mail or courier to the friendly neighborhood Slime Node that has agreed to accept it. We will isolate all the fungi we can by dilution and streak plating, arrange for DNA barcoding, and inform you of results as they come in.

References

McFadden-Smith W. 2011. Tender Fruit 15(5): 8 (http://www.omafra.gov.on.ca/english/crops/hort/news/tenderfr/tfl505.pdf)

Weber, R.W.S. 2006. On the ecology of fungal consortia of spring sap-flows. Mycologist 20: 140-143 (doi:10.1016/j.mycol.2006.09.015)



Figs 4-8. Slime fluxes from the USA (4, 5), and on grapes (6, 7) and *Ostrya virginiana*, Canada.